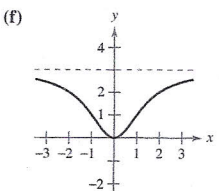
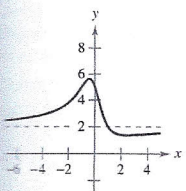
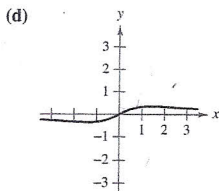
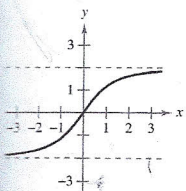
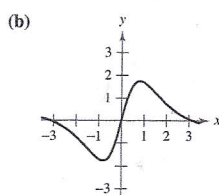
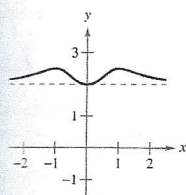


EXERCISES FOR SECTION 3.5

Exercises 1–6, match the function with one of the graphs [(a), (c), (d), (e), or (f)] using horizontal asymptotes as an aid.



1. $f(x) = \frac{3x^2}{x^2 + 2}$

2. $f(x) = \frac{x}{x^2 + 2}$

3. $f(x) = \frac{4 \sin x}{x^2 + 1}$

4. $f(x) = \frac{2x}{\sqrt{x^2 + 2}}$

5. $f(x) = 2 + \frac{x^2}{x^4 + 1}$

6. $f(x) = \frac{2x^2 - 3x + 5}{x^2 + 1}$

Numerical and Graphical Analysis In Exercises 7–12, use a graphing utility to complete the table and estimate the limit as x approaches infinity. Then use a graphing utility to graph the function and estimate the limit graphically.

x	10^0	10^1	10^2	10^3	10^4	10^5	10^6
$f(x)$							

7. $f(x) = \frac{4x + 3}{2x - 1}$

8. $f(x) = \frac{-6x}{\sqrt{4x^2 + 5}}$

9. $f(x) = 5 - \frac{1}{x^2 + 1}$

10. $f(x) = \frac{2x^2}{x + 1}$

11. $f(x) = \frac{8x}{\sqrt{x^2 - 3}}$

12. $f(x) = 4 + \frac{3}{x^2 + 2}$

In Exercises 13 and 14, find $\lim_{x \rightarrow \infty} h(x)$, if possible.

13. $f(x) = 5x^3 - 3x^2 + 10$

(a) $h(x) = \frac{f(x)}{x^2}$

(b) $h(x) = \frac{f(x)}{x^3}$

(c) $h(x) = \frac{f(x)}{x^4}$

14. $f(x) = 5x^2 - 3x + 7$

(a) $h(x) = \frac{f(x)}{x}$

(b) $h(x) = \frac{f(x)}{x^2}$

(c) $h(x) = \frac{f(x)}{x^3}$

In Exercises 15–18, find each of the limits, if possible.

15. (a) $\lim_{x \rightarrow \infty} \frac{x^2 + 2}{x^3 - 1}$

(b) $\lim_{x \rightarrow \infty} \frac{x^2 + 2}{x^2 - 1}$

(c) $\lim_{x \rightarrow \infty} \frac{x^2 + 2}{x - 1}$

17. (a) $\lim_{x \rightarrow \infty} \frac{5 - 2x^{3/2}}{3x^2 - 4}$

(b) $\lim_{x \rightarrow \infty} \frac{5 - 2x^{3/2}}{3x^{3/2} - 4}$

(c) $\lim_{x \rightarrow \infty} \frac{5 - 2x^{3/2}}{3x - 4}$

16. (a) $\lim_{x \rightarrow \infty} \frac{3 - 2x}{3x^3 - 1}$

(b) $\lim_{x \rightarrow \infty} \frac{3 - 2x}{3x - 1}$

(c) $\lim_{x \rightarrow \infty} \frac{3 - 2x^2}{3x - 1}$

18. (a) $\lim_{x \rightarrow \infty} \frac{5x^{3/2}}{4x^2 + 1}$

(b) $\lim_{x \rightarrow \infty} \frac{5x^{3/2}}{4x^{3/2} + 1}$

(c) $\lim_{x \rightarrow \infty} \frac{5x^{3/2}}{4\sqrt{x} + 1}$

In Exercises 19–32, find the limit.

19. $\lim_{x \rightarrow \infty} \frac{2x - 1}{3x + 2}$

21. $\lim_{x \rightarrow \infty} \frac{x}{x^2 - 1}$

23. $\lim_{x \rightarrow \infty} \frac{5x^2}{x + 3}$

25. $\lim_{x \rightarrow \infty} \frac{x}{\sqrt{x^2 - x}}$

27. $\lim_{x \rightarrow \infty} \frac{2x + 1}{\sqrt{x^2 - x}}$

29. $\lim_{x \rightarrow \infty} \frac{\sin 2x}{x}$

31. $\lim_{x \rightarrow \infty} \frac{1}{2x + \sin x}$

20. $\lim_{x \rightarrow \infty} \frac{3x^3 + 2}{9x^3 - 2x^2 + 7}$

22. $\lim_{x \rightarrow \infty} \left(4 + \frac{3}{x}\right)$

24. $\lim_{x \rightarrow \infty} \left(\frac{1}{2}x - \frac{4}{x^2}\right)$

26. $\lim_{x \rightarrow \infty} \frac{x}{\sqrt{x^2 + 1}}$

28. $\lim_{x \rightarrow \infty} \frac{-3x + 1}{\sqrt{x^2 + x}}$

30. $\lim_{x \rightarrow \infty} \frac{x - \cos x}{x}$

32. $\lim_{x \rightarrow \infty} \cos \frac{1}{x}$

In Exercises 33 and 34, use a graphing utility to graph the function and verify that it has two horizontal asymptotes.

33. $f(x) = \frac{|x|}{x + 1}$

34. $f(x) = \frac{3x}{\sqrt{x^2 + 2}}$